

CLAIMS

1. Use of a polymer comprising water-soluble units and units with an LCST, the units with an LCST having in water a demixing temperature of from 5 to 40°C at a concentration of 1% by mass in water, to lower the surface tension or the interface tension of water.
- 10 2. Use according to Claim 1, in which the lowering of the surface tension or of the interface tension of water is of at least 15 mN/m for a concentration of polymer in water of 0.1% by mass in the temperature range from 5 to 80°C.
- 15 3. Use according to Claim 1, in which the lowering of the surface tension or of the interface tension of water is of at least 20 mN/m for a concentration of polymer in water of 0.1% by mass when the temperature is higher than the demixing temperature of the units with an LCST at this concentration.
- 20 4. Use of a polymer comprising water-soluble units and units with an LCST, the units with an LCST having in water a demixing temperature of from 5 to 40°C at a concentration of 1% by mass in water, to manufacture a foam.
- 25 5. Use of a polymer comprising water-soluble units and units with an LCST, the units with an LCST having in water a demixing temperature of from 5 to 40°C at a concentration of 1% by mass in water, to manufacture a foam, also

comprising a foaming surfactant at a concentration of less than or equal to 5% by mass.

5 6. Use of a polymer comprising water-soluble units and units with an LCST, the units with an LCST having in water a demixing temperature of from 5 to 40°C at a concentration of 1% by mass in water, to manufacture an emulsion free of additional emulsifying surfactant or containing an additional emulsifying surfactant at a concentration of less than or equal to 1% by mass.

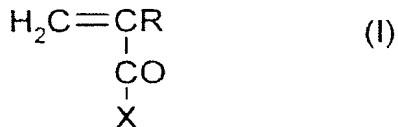
10 15 7. Foaming composition comprising an aqueous phase containing a polymer comprising water-soluble units and units with an LCST, the units with an LCST having in water a demixing temperature of from 5 to 40°C at a concentration of 1% by mass in water.

20 25 30 35 8. Foaming composition according to Claim 7, in which the polymer is in the form of a block polymer comprising water-soluble units alternating with units with an LCST, or in the form of a grafted polymer whose backbone is formed from water-soluble units and which bears grafts consisting of units with an LCST, this structure possibly being partially crosslinked, or alternatively in the form of a grafted polymer whose backbone is formed from units with an LCST and which bears grafts consisting of water-soluble units, this structure possibly being partially crosslinked.

9. Foaming composition according to either of
Claims 7 and 8, in which the water-soluble
units are obtained by free-radical
5 polymerization of at least one monomer chosen
from:

- (meth)acrylic acid;
- vinyl monomers of formula (I) below:

10



in which:

- R is chosen from H, -CH₃, -C₂H₅ or -C₃H₇, and
- X is chosen from:
 - alkyl oxides of -OR' type in which R' is a linear or branched, saturated or unsaturated hydrocarbon radical containing from 1 to 6 carbon atoms, optionally substituted with at least one halogen atom (iodine, bromine, chlorine or fluorine); a sulphonic (-SO₃⁻), sulphate (-SO₄²⁻), phosphate (-PO₄H₂); hydroxyl (-OH); primary amine (-NH₂); secondary amine ('-NHR₁), tertiary amine (-NR₁R₂) or quaternary amine (-N⁺R₁R₂R₃) group with R₁, R₂ and R₃ being, independently of each other, a linear or branched, saturated or unsaturated hydrocarbon radical containing 1 to 6 carbon atoms, with the proviso that the sum of the carbon atoms of R' + R₁ + R₂ + R₃ does not exceed 7; and

- -NH₂, -NHR₄ and -NR₄R₅ groups in which R₄ and R₅ are, independently of each other, linear or branched, saturated or unsaturated hydrocarbon radicals containing 1 to 6 carbon atoms, with the proviso that the total number of carbon atoms in R₄ + R₅ does not exceed 7, the said R₄ and R₅ optionally being substituted with a halogen atom (iodine, bromine, chlorine or fluorine); a hydroxyl (-OH); sulphonic (-SO₃⁻), sulphate (-SO₄⁻); phosphate (-PO₄H₂); primary amine (-NH₂); secondary amine (-NHR₁), tertiary amine (-NR₁R₂) and/or quaternary amine (-N⁺R₁R₂R₃) group with R₁, R₂ and R₃ being, independently of each other, a linear or branched, saturated or unsaturated hydrocarbon radical containing 1 to 6 carbon atoms, with the proviso that the sum of the carbon atoms of R₄ + R₅ + R₁ + R₂ + R₃ does not exceed 7;
- maleic anhydride;
- itaconic acid;
- vinyl alcohol of formula CH₂=CHOH;
- vinyl acetate of formula CH₂=CH-OCOCH₃;
- N-vinyl lactams such as N-vinylpyrrolidone, N-vinylcaprolactam and N-butyrolactam;
- vinyl ethers of formula CH₂=CHOR₆ in which R₆ is a linear or branched, saturated or unsaturated hydrocarbon radical containing from 1 to 6 carbon atoms;
- water-soluble styrene derivatives, especially styrene sulphonate;
- dimethyldiallylammonium chloride; and

- vinylacetamide.

- 5 10. Foaming composition according to either of
Claims 7 and 8, in which the water-soluble
units consist totally or partially of one or
more of the following components:

15 - water-soluble polyurethanes,
- xanthan gum,
- alginates and derivatives thereof such as
propylene glycol alginate,
- cellulose derivatives and especially
carboxymethylcellulose,
hydroxypropylcellulose,
hydroxyethylcellulose and quaternized
hydroxyethylcellulose,
- galactomannans and derivatives thereof such
as konjac gum, guar gum, hydroxypropylguar,
hydroxypropylguar modified with sodium
methylcarboxylate groups, and
hydroxypropyltrimethylammonium
chloride, and
- polyethyleneimine.

20 25 11. Foaming composition according to any one of
Claims 7 to 10, in which the water-soluble
units have a molar mass ranging from
1000 g/mol to 5 000 000 g/mol when they
constitute the water-soluble backbone of a
grafted polymer, or a molar mass ranging from
500 g/mol to 100 000 g/mol when they
constitute one block of a multiblock polymer
or when they constitute the grafts of a
grafted polymer.

12. Foaming composition according to any one of Claims 7 to 11, in which the units with an LCST consist of one or more of the following polymers:

5

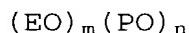
- polyethers such as polyethylene oxide (PEO), polypropylene oxide (PPO) and random copolymers of ethylene oxide (EO) and of propylene oxide (PO),
- polyvinyl methyl ethers,
- polymeric N-substituted acrylamide derivatives such as poly-N-isopropylacrylamide, poly-N-ethylacrylamide and copolymers of N-isopropylacrylamide or of N-ethylacrylamide and of a vinyl monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallylammonium chloride, vinylacetamide, vinyl ethers and vinyl acetate derivatives; and
- polyvinylcaprolactam and copolymers of vinylcaprolactam and of a vinyl monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallylammonium chloride, vinylacetamide, vinyl ethers and vinyl acetate derivatives.

13. Foaming composition according to any one of Claims 7 to 11, in which the units with an LCST consist of polypropylene oxides of

35

formula $(PPO)_n$ with n being an integer from 10 to 50, or random copolymers of ethylene oxide (EO) and of propylene oxide (PO), represented by the formula:

5



in which m is an integer ranging from 1 to 40 and preferably from 2 to 20, and n is an integer ranging from 10 to 60 and preferably from 20 to 50.

- 10 14. Foaming composition according to Claim 13, in which the molar mass of the units with an LCST is from 500 to 5300 g/mol and preferably from 1500 to 4000 g/mol.
- 15 15. Foaming composition according to Claim 12, in which the units with an LCST consist of poly-N-isopropylamide or poly-N-ethylacrylamide or a copolymer of N-isopropylacrylamide or of N-ethylacrylamide and of a monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallylammonium chloride, vinylacetamide, vinyl alcohol, vinyl acetate, vinyl ethers and vinyl acetate derivatives.
- 20 25 30 16. Foaming composition according to Claim 15, in which the molar mass of the units with an LCST is from 1000 g/mol to 500 000 g/mol and preferably from 2000 to 50 000 g/mol.

- 5 17. Foaming composition according to any one of
Claims 7 to 11, in which the units with an
LCST consist of a polyvinylcaprolactam or a
copolymer of vinylcaprolactam and of a vinyl
monomer corresponding to formula (I) given in
Claim 9, or of a monomer chosen from maleic
anhydride, itaconic acid, vinylpyrrolidone,
styrene and its derivatives,
dimethyldiallylammmonium chloride,
10 vinylacetamide, vinyl alcohol, vinyl acetate,
vinyl ethers and vinyl acetate derivatives.

15 18. Foaming composition according to Claim 17, in
which the molar mass of the units with an LCST
is from 1000 to 500 000 g/mol and preferably
from 2000 to 50 000 g/mol.

20 19. Foaming composition according to any one of
Claims 7 to 18, in which the proportion by
mass of the units with an LCST of the polymer
is from 5 to 70%, preferably from 20 to 65%
and better still from 30 to 60% relative to
the polymer.

25 20. Foaming composition according to any one of
Claims 7 to 19, in which the demixing
temperature of the units with an LCST is from
5 to 40°C for a concentration of the units
with an LCST in water of 1% by mass.

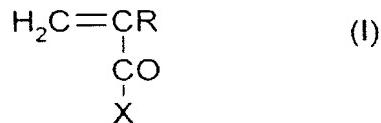
30 21. Foaming composition according to any one of
Claims 7 to 20, in which the concentration by
mass of polymer in the aqueous phase is less
than or equal to 5% and preferably from 0.01%
35 to 5%.

22. Foaming composition according to any one
Claims 7 to 21, in which the aqueous phase
also comprises a foaming surfactant in a
5 concentration not exceeding 5% by mass.
23. Oil-in-water emulsion comprising an aqueous
phase and an oily phase dispersed in the
aqueous phase, in which the aqueous phase
10 comprises a polymer comprising water-soluble
units and units with an LCST, the units with
an LCST having in water a demixing temperature
of from 5 to 40°C at a concentration of 1% by
mass in water.
- 15
24. Water-in-oil-in-water emulsion comprising a
water-in-oil emulsion dispersed in an outer
aqueous phase, in which the outer aqueous
phase comprises a polymer comprising water-
soluble units and units with an LCST, the
20 units with an LCST having in water a demixing
temperature of from 5 to 40°C at a
concentration of 1% by mass in water.
25. Emulsion according to Claim 23 or 24, in which
the polymer is in the form of a block polymer
comprising water-soluble units alternating
with units with an LCST, or in the form of a
30 grafted polymer whose backbone is formed from
water-soluble units and which bears grafts
consisting of units with an LCST, this
structure possibly being partially
crosslinked, or alternatively in the form of a
grafted polymer whose backbone is formed from
35 units with an LCST and which bears grafts

consisting of water-soluble units, this structure possibly being partially crosslinked.

5 26. Emulsion according to any one of Claims 23 to
25, in which the water-soluble units are
obtained by free-radical polymerization of at
least one monomer chosen from:

- 10 - (meth)acrylic acid;
 - vinyl monomers of formula (I) below:



15 in which:

- R is chosen from H, -CH₃, -C₂H₅ or -C₃H₇, and
 - X is chosen from:
 - alkyl oxides of -OR' type in which R' is a linear or branched, saturated or unsaturated hydrocarbon radical containing from 1 to 6 carbon atoms, optionally substituted with at least one halogen atom (iodine, bromine, chlorine or fluorine); a sulphonic (-SO₃⁻), sulphate (-SO₄⁻), phosphate (-PO₄H₂); hydroxyl (-OH); primary amine (-NH₂); secondary amine (-NHR₁), tertiary amine (-NR₁R₂) or quaternary amine (-N⁺R₁R₂R₃) group with R₁, R₂ and R₃ being independently of each other, a linear or branched, saturated or unsaturated hydrocarbon radical containing 1 to 6 carbon atoms, with the proviso that the

- sum of the carbon atoms of $R_4 + R_1 + R_2 + R_3$ does not exceed 7; and
- -NH₂, -NHR₄ and -NR'R₅ groups in which R₄ and R₅ are, independently of each other, linear or branched, saturated or unsaturated hydrocarbon radicals containing 1 to 6 carbon atoms, with the proviso that the total number of carbon atoms in $R_4 + R_5$ does not exceed 7, the said R₄ and R₅ optionally being substituted with a halogen atom (iodine, bromine, chlorine or fluorine); a hydroxyl (-OH); sulphonic (-SO₃⁻), sulphate (-SO₄⁻); phosphate (-PO₄H₂); primary amine (-NH₂); secondary amine (-NHR₁), tertiary amine (-NR₁R₂) and/or quaternary amine (-N⁺R₁R₂R₃) group with R₁, R₂ and R₃ being, independently of each other, a linear or branched, saturated or unsaturated hydrocarbon radical containing 1 to 6 carbon atoms, with the proviso that the sum of the carbon atoms of $R_4 + R_5 + R_1 + R_2 + R_3$ does not exceed 7;
- maleic anhydride;
- itaconic acid;
- vinyl alcohol of formula CH₂=CHOH;
- vinyl acetate of formula CH₂=CH-OCOCH₃;
- N-vinyllactams such as N-vinylpyrrolidone, N-vinylcaprolactam and N-butyrolactam;
- vinyl ethers of formula CH₂=CHOR in which R₆ is a linear or branched, saturated or unsaturated hydrocarbon radical containing from 1 to 6 carbon atoms;

- water-soluble styrene derivatives, especially styrene sulphonate;
- dimethyldiallylammonium chloride; and
- vinylacetamide.

5

27. Emulsion according to any one of Claims 23 to 25, in which the water-soluble units consist totally or partially of one or more of the following components:

10

- water-soluble polyurethanes,
- xanthan gum,
- alginates and derivatives thereof such as propylene glycol alginate,
- cellulose derivatives and especially carboxymethylcellulose, hydroxypropylcellulose, hydroxyethylcellulose and quaternized hydroxyethylcellulose,
- galactomannans and derivatives thereof such as konjac gum, guar gum, hydroxypropylguar, hydroxypropylguar modified with sodium methylcarboxylate groups, and hydroxypropyltrimethylammonium guar chloride, and
- polyethyleneimine.

15

20

25

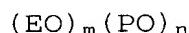
30

28. Emulsion according to any one of Claims 23 to 27, in which the water-soluble units have a molar mass ranging from 1000 g/mol to 5 000 000 g/mol when they constitute the water-soluble backbone of a grafted polymer, or a molar mass ranging from 500 g/mol to 100 000 g/mol when they constitute one block

of a multiblock polymer or when they constitute the grafts of a grafted polymer.

29. Emulsion according to any one of Claims 23 to 5, in which the units with an LCST consist of one or more of the following polymers:
- polyethers such as polyethylene oxide (PEO), polypropylene oxide (PPO) and random copolymers of ethylene oxide (EO) and of propylene oxide (PO),
 - polyvinyl methyl ethers,
 - polymeric N-substituted acrylamide derivatives such as poly-N-isopropylacrylamide, poly-N-ethylacrylamide and copolymers of N-isopropylacrylamide or of N-ethylacrylamide and of a vinyl monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallylammonium chloride, vinylacetamide, vinyl ethers and vinyl acetate derivatives; and
 - polyvinylcaprolactam and copolymers of vinylcaprolactam and of a vinyl monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallylammonium chloride, vinylacetamide, vinyl ethers and vinyl acetate derivatives.

30. Emulsion according to any one of Claims 23 to 28, in which the units with an LCST consist of polypropylene oxide of formula $(PPO)_n$ with n being an integer from 10 to 50, or random 5 copolymers of ethylene oxide (EO) and of propylene oxide (PO), represented by the formula:



10

in which m is an integer ranging from 1 to 40 and preferably from 2 to 20, and n is an integer ranging from 10 to 60 and preferably from 20 to 50.

15

31. Emulsion according to Claim 30, in which the molar mass of the units with an LCST is from 500 to 5300 g/mol and preferably from 1500 to 4000 g/mol.

20

25

30

32. Emulsion according to Claim 29, in which the units with an LCST consist of poly-N-isopropylacrylamide or poly-N-ethylacrylamide or a copolymer of N-isopropylamide or of N-ethylacrylamide and of a monomer corresponding to formula (I) given in Claim 9, or of a monomer chosen from maleic anhydride, itaconic acid, vinylpyrrolidone, styrene and its derivatives, dimethyldiallyl ammonium chloride, vinylacetamide, vinyl alcohol, vinyl acetate, vinyl ethers and vinyl acetate derivatives.

33. Emulsion according to Claim 32, in which the molar mass of the units with an LCST is from

1000 g/mol to 500 000 g/mol and preferably from 2000 to 50 000 g/mol.

- 5 34. Emulsion according to any one of Claims 23 to
28, in which the units with an LCST consist of
a polyvinylcaprolactam or a copolymer of
vinylcaprolactam and of a vinyl monomer
corresponding to formula (I) given in Claim 9,
or of a monomer chosen from maleic anhydride,
10 itaconic acid, vinylpyrrolidone, styrene and
its derivatives, dimethyldiallylammonium
chloride, vinylacetamide, vinyl alcohol, vinyl
acetate, vinyl ethers and vinyl acetate
derivatives.

15 35. Emulsion according to Claim 34, in which the
molar mass of the units with an LCST is from
1000 to 500 000 g/mol and preferably from 2000
to 50 000 g/mol.

20 36. Emulsion according to any one of Claims 23 to
35, in which the proportion by mass of the
units with an LCST of the polymer is from 5 to
70%, preferably from 20 to 65% and better
25 still from 30 to 60% relative to the polymer.

30 37. Emulsion according to any one of Claims 23 to
36, in which the demixing temperature of the
units with an LCST is from 5 to 40°C for a
concentration of the units with an LCST in
water of 1% by mass.

35 38. Emulsion according to any one of Claims 23 to
37, in which the concentration by mass of

polymer in the aqueous phase is less than or equal to 5% and preferably from 0.01% to 5%.

39. Emulsion according to any one of Claims 23 to 5, in which the aqueous phase also comprises an emulsifying surfactant at a concentration not exceeding 1%.
40. Emulsion according to any one of Claims 23 to 10, also comprising a gelling agent.
41. Cosmetic use of the foaming composition according to any one of Claims 7 to 22, for 15 cleansing and/or removing make-up from the skin, including the scalp, the nails, the hair, the eyelashes, the eyebrows, the eyes, mucous membranes and semi-mucous membranes, and any other area of body or facial skin.
- 20 42. Cosmetic use of a cosmetic emulsion according to any one of Claims 23 to 40, for treating, caring for, protecting and/or making up facial skin and/or body skin, mucous membranes (lips), the scalp and/or keratin fibres.
- 25 43. Cosmetic process for cleansing and/or removing 30 make-up from the skin, the scalp and/or the hair, characterized in that the composition of the invention is applied to the skin, to the scalp and/or to the hair, in the presence of water, and the foam formed and the soiling residues are removed by rinsing with water.